

medical professionals who act as consultants for companies, the industry may try to influence the revision of diagnostic criteria in its favour. Given that introduction of new or substantially altered diagnostic criteria could lead to drug treatments for millions of patients in the long term, one could argue that such changes should undergo clinical trials following the same strict rules as those for new drugs.

Given these fundamental problems, one might already count it as a success if the inflation in the number of diagnoses from one edition to the next has now been stopped. Still, the broadening of diagnostic criteria, leading to a wider group of patients being diagnosed, remains a concern for many, especially if the criteria set by the APA get exported and have a knock-on effect on the WHO's disease manual ICD-11 (International Classification of Diseases), due to be released by 2015. Chapman and Frances are concerned that the new definition of SSD will also be reflected in ICD-11. "ICD-11 is field testing a new category — 'Bodily Distress Disorder' — proposed to replace six or seven existing ICD-10 somatoform disorders, which, according to working group reports on emerging proposals, mirrors the DSM-5 somatic symptom disorder definition," says Chapman.

The trend towards a narrowing definition of 'normal' in psychiatry may also reflect wider trends in society, often set in the US and exported globally. "I think the scientifically unjustified widening of psychiatric diagnosis reflects in part the Facebook mentality of promoting conformity, perfectionism, and intolerance for individual difference — as well as reflecting the greed of Big Pharma which will be satisfied only when every man, woman, and child is taking a psychiatric pill," says Allen Frances.

If these trends are allowed to continue, those of us who still haven't been diagnosed with a mental disorder may have to fight to cling on to this normality, to avoid getting into a farcical situation like Molière's *invalide*.

Michael Gross is a science writer based at Oxford. He can be contacted via his web page at [www.michaelgross.co.uk](http://www.michaelgross.co.uk)

## Book review

### Superfly

Marcus C. Stensmyr

*Flies: The Natural History and Diversity of Diptera*

Stephen A. Marshall

Firefly Books

ISBN -13:978-1-77085-100-9

*"And the Lord did so; and there came a grievous swarm of flies into the house of Pharaoh, and into his servants' houses, and into all the land of Egypt: the land was corrupted by reason of the swarm of flies." Exodus 8:24*

Flies have a bad reputation. And not wholly unwarranted. Many Diptera (the taxonomic term for flies, mosquitoes, midges, gnats and other two-winged insects) not only bite, suck blood and generally annoy, but they also transmit deadly diseases, of which malaria is a prime example. The annual death toll from fly-carried sicknesses count in the millions. As if that was not enough, flies can also be destructive agricultural pests, such as the Mediterranean fruit fly, which, thanks to its voracious appetite for fruit, inflicts tremendous damage. Together with cockroaches,

flies and their allies probably rank as the least appreciated insects on the planet. No surprise, then, that when it came to tormenting people, the Lord's weapon of choice has been flies. A contributing factor to the poor standing of flies is surely their disposition for breeding in and feeding on decaying matter, particularly in things considered unclean by humans. For us, flies represent the very antithesis to cleanliness and health. Coming up with ways of getting rid of flies has thus been a preoccupation throughout human history.

In light of their bad reputé, the notion of an opulently illustrated coffee table book focusing on flies may seem odd. But this is exactly what Stephen Marshall has accomplished. Weighing in at 2.5 kg, *Flies: The Natural History and Diversity of Diptera*, is a monster of a book, in which flies (and their allies) are finally given the veneration they rightly deserve. In contrast to prior tomes devoted to the Diptera, which have all been rather dreary affairs targeted towards taxonomists, Marshall's *Flies* is a colorful account of all things fly that will appeal to specialists, non-specialists and laymen alike. The text is accessibly written and the author's evident affection and fascination for his subjects are evident throughout the book's 600 pages. But what really

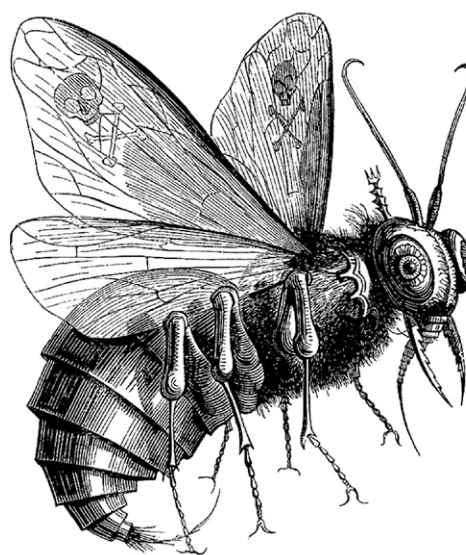


Figure 1. The fly curse.

Flies' penchant for filth and blood, and their ability to spread diseases have cemented this group of insect's poor reputation. Left, Beelzebub, chief demon of hell, and "Lord of the flies". Top right, black blow flies (*Phormia regina*) drawn to the carrion smell of a stinkhorn fungus. Below, a *Sabethes tarsopus* mosquito — a yellow fever vector — enjoying a blood meal. Photographs by Stephen A. Marshall.



Figure 2. Fly bonanza.

Among the 160,000 or so known fly species, there is huge variability in form and lifestyle. Depicted from upper left to lower right: this humpback fly (Acroceridae, *Megalybus crassus*) is a specialized parasitoid upon ecribellate spiders; many flies are kleptoparasites, such as these rather un-fly looking bee lice (Braulidae, *Braula coeca*) clinging on to a honey bee; distinctly colored and patterned eyes are a characteristic feature of the hoverfly (Syrphidae) genus *Eristalinus*, of which *E. megacephalus* is shown here; most beetle flies (Celyphidae), like this *Spaniocelyphus levis*, do indeed show a striking resemblance to beetles; horse flies (Tabanidae), such as this technicolor-eyed *Diachlorus bicinctus*, have a fierce bite; flies with sidewise elongated eyes are found in many fly families, but is perhaps most pronounced in stalk eyed flies (Diopsidae, notice also the widely separated antennae in this specimen of *Diasemopsis nebulosa*); a golden dung fly (Scathophagidae, *Scatophaga stercoraria*) busy sucking the guts out of an unfortunate flesh fly (Sarcophagidae); phantom crane flies (Ptychopteridae, *Bittacomorpha* sp.) float ghost-like through the air, aided by air-filled sacs in their legs that are characteristically outstretched in flight; love bugs (Bibionidae), like these *Plecia nearctica*, are significant pollinators. All photographs by Stephen A. Marshall.

sets *Flies* apart, are the over 2000 photos — nearly all taken by the author himself — most of which depict flies in their natural environment.

*Flies* is divided into three parts. The first part (Life histories, Habits and Habitats of Flies) contains an ample overview of the diverse lifestyles found among flies. Through numerous examples, Marshall makes it clear that flies do not only muck

about in decaying matter, or feed on blood, but are also accomplished pollinators, predators, parasitoids as well as crafty thieves. A curious example of the latter are the misnamed bee lice, which have recently (and surprisingly) been revealed as the closest relatives of the vinegar flies — the family to which *Drosophila melanogaster*, perhaps biology's favorite lab pet,

belongs. Bee lice, which look nothing like flies at all, cling on to honey bees and unlike genuine lice do not feed on their hosts, but simply tag along, occasionally nipping food from the mouth of the bees. Throughout his book, Marshall provides numerous such fascinating cases of fly biology, and even for veterans in the field of Diptera research, there is likely to be much to discover here.



In the second part of the book, Marshall explores the diversity of flies, providing comprehensive information on all the families, including details about the biology (where known), relationships, and in many cases curious anecdotes relating to their discovery. Although Marshall's text is entertaining and highly informative, the accompanying photographic guide is certainly the book's most impressive feature. In the same manner that flies have evolved a plethora of lifestyles, flies also come in many different shapes and forms. Many species certainly stray from the fly stereotype — best exemplified by the common housefly *Musca domestica*, probably the most familiar fly, or even insect species — looking superficially nothing like one would expect a fly to look like, such as the stilt-legged flies, with their long hind legs and elongated body.

Another particularly striking feature of fly morphology are the many kinds of mimics, where flies take on the guise of bees, ants, termites or beetles. In the third and final section of the book, Marshall shares tips and tricks for studying (and photographing) flies. These pieces of advice range from how to trap flies (e.g. to catch frog midges, one should play a recording of tree frog calls), to the proper way of using Google Earth for designing labels for pinned specimens, to identifying flies. To help with the latter endeavor, Marshall in the final pages of the book also provides a very nice, illustrated key to all fly families.

With around 160,000 described species, and a myriad probably still left to be discovered, flies must be considered a success story in the history of life. Marshall estimates the number of fly species at between 400,000 and 800,000, which if true (it very likely is), would make flies the most speciose insect order, outnumbering the beetles (Coleoptera) with around 400,000 known species (granted, there are numerous beetle species left to be discovered as well). Thus, Haldane's famous statement that "God must have an inordinate fondness for beetles," should really be rephrased, since God may actually be even more fond of flies (or very keen on tormenting people). The huge diversity of flies makes this group of insects a daunting topic for studies. Accordingly, most dipterists work solely on single groups of flies, which still is a challenge given the large size

of most families. The holistic approach taken by Marshall is a welcome addition to the field, where work of a synthetic nature has been rare. Having access to all information in one place makes it far easier to see parallels in lifestyles and morphology among the diverse groups that make up the order.

*Flies* is not only for keen dipterists, but is also of relevance to experimental biologists as a whole. The book is full of intriguing glimpses of biological wonders that at best have been examined rudimentarily in the old days and that are now ripe for exploration with contemporary techniques. Which signals trigger the radical metamorphosis of termite flies once they enter termite nests? How is this metamorphosis accomplished and which are the signals emitted by these flies in order not to be evicted from the nests? What is the *raison d'être* for the spotted and striped eyes of *Eristalinus* hoverflies? How do you evolve stalked eyes, and how does having these affect visual processing? What is the benefit of looking like a beetle? Why do upside-down flies always maintain a head-down position on vertical surfaces? With the advent of cheap and quick whole-genome sequencing, and improved methods for generating transgenic animals outside established model systems, these questions, and many others, are now (in principle) accessible for in depth analyses. Flies, moreover, have the distinct advantage of being (more or less) closely related to the fly *Drosophila melanogaster*. Findings from any of the odd creatures depicted in the book could hence be placed in the context of a thoroughly examined model system, and as such could be used to unravel general mechanisms as well as functions of specific genes.

Although a number of fly species do indeed cause trouble, the vast majority of flies are upstanding members of the insect community, with little, or no interest for man and his activities. Flies are critical ingredients in the ecosystem, without which we would be living in a much shittier world (literally). Marshall's *Flies* will hopefully improve the tarnished reputation of this fascinating group of insects.

Max Planck Institute for Chemical Ecology,  
Department of Evolutionary Neuroethology,  
Jena, Germany.  
E-mail: [mstensmyr@ice.mpg.de](mailto:mstensmyr@ice.mpg.de)

## Q & A

### Rosemary and Peter Grant

*Rosemary Grant was initially trained at the University of Edinburgh, received a Ph.D. degree from Uppsala University, and was a research scholar and lecturer with the rank of Professor in the Department of Ecology and Evolutionary Biology at Princeton University until she retired from teaching in 2008.*

*Peter Grant is the Class of 1877 Professor Emeritus in the same Department, having trained at Cambridge University and the University of British Columbia. Before joining Princeton in 1986 he taught at McGill University and the University of Michigan. Their work on Darwin's finches has been recognized with the award of the Darwin Medal (2002), the Darwin and Wallace Medal (2008), The Balzan Prize (2005) and the Kyoto Prize (2009).*

**What turned you on to biology in the first place?** Rosemary: I grew up in a small coastal village in the Lake District of North-West England, famous for its fossil rich limestone cliffs, rare species of butterflies and wild flowers. Free to roam the fells and experience such diversity of life, I became fascinated with the enormous variety of organisms. My parents explained that all living things were related, and that the fossils I found were remains of animals and plants now extinct. When I was a little older they suggested I should read Darwin's "Origin of Species". In my teens, I thought that the study of genetics would provide me with the basis for understanding how populations diverge to the point of becoming different species. Believing, and I think rightly, that in the 1950s Edinburgh University was one of the foremost departments of genetics in the world, I applied there as an undergraduate. In my third year, I was fortunate to be accepted into a genetics diploma course, consisting of a small group of national and international students, and led by